Canyon Connections:
Grand Canyon Distance Learning Program (Ecology)

Last revised: 11/23/15 (we review and update our lesson plans annually. Latest versions can be found online at http://www.nps.gov/grca/learn/education/learning/canyon-connections.htm)

Pre-program lesson: Complete the following activity prior to the distance learning program.

Grand Canyon Focus: Ecology
School Subject: Life science
Grade Levels: 4^{th} – 8^{th}
Time Requirement: One or two class periods (*60-90 minutes*)

National Standards Addressed in the pre-lesson:
Our programs are aligned to National Science Standards, Next Generation Science Standards, and Common Core. For a full listing of all the standards this program addresses please follow the link at the top of the page and open the Canyon Connection Standards PDF.

Lesson Overview
Grand Canyon is a classroom and laboratory where the study of ecology teaches us about our interconnections between each other and with the rest of the natural world. With five different ecosystems, students learn about the interactions within each ecosystem and how plants and animals have adapted to survive.

Lesson Objectives: Students will be able to:
1. Demonstrate research skills
2. Discuss the difference between biotic and abiotic parts of an ecosystem and provide examples of each
3. Compare home ecosystem to one of the five ecosystems found at Grand Canyon

Materials
The ecosystem article can be found at: http://www.nps.gov/grca/learn/education/learning/canyon-connections.htm
- *Grand Canyon Ecosystems* article PDF (1 per student or group)
- White poster paper (one piece approximately 8" x 36" per team)
- Markers, paints and other art supplies for drawing ecosystems

Background Information
The concept of an ecosystem is important because it conveys one of the key insights that we have gained from the science of ecology, that everything is related to everything else. Everyday perception tells us that we live in a world composed of distinct units: trees, rocks, animals, buildings, and so on. Yet all of these seemingly unconnected fragments are in fact part of one system; they are interrelated, and this interrelation is essential for life. Since no piece exists independently of another, none can be modified without affecting the others. It is this idea that is behind the term "ecosystem". In the study of Ecology, we identify the species and community to which an organism belongs and how it interacts with the ecosystem and other organisms in the ecosystem. Scientists have also studied the interaction between different organisms and classified their interactions into different types. All of these interactions form a "web of life". When organisms are removed, the interactions and connections are broken and the web is weakened. Humans are a part of every ecosystem, so everything we do affects the parts of an ecosystem.

Procedure

Grand Canyon Ecosystems Article
This article can be found as a PDF, at:
http://www.nps.gov/grca/learn/education/learning/canyon-connections.htm
More information to compliment your lesson can be found on Grand Canyon's science page:
http://www.nps.gov/grca/learn/nature/index.htm

This article was created to offer students background information on Grand Canyon's ecosystems and serve as a resource for gathering information about their ecosystem in a manner that is appropriate for their age level. Feel free to incorporate computer lab time or visit your library to gather additional information about Grand Canyon and the ecosystem(s) found near your home/school.

1. Distribute the *Grand Canyon Ecosystems* article to each student or group of 4-6 students.
2. Ask each child to read **page one AND page seven** of the article silently, or in a group. You may wish to read **page one and page seven** out loud with the students.
3. Highlight what an ecosystem is. This article introduces non-living components as an important part of the ecosystem. Ask the children to think of abiotic (non-living: i.e. water, sun, air, rock) and biotic (living: i.e. plants and animals) components in their environment and discuss how they interact. Include examples from your local ecosystem in the discussion. Time permitting, guide ecosystem research in your computer lab or library to gather additional information.
4. Now that they have been introduced to Grand Canyon's ecosystems, divide the class into five groups. Assign each group to one of the five ecosystems. Ask the groups to read the section on their particular ecosystem. Each ecosystem has a unique question for the groups to answer. Please assist them if they don't fully understand how to answer their question.
5. Each group will collect information from the article and/or group research to answer the questions on **page eight** of the article. Page nine is an index of vocabulary words covered for the students to reference during their research. Page ten is additional resources for the students if they have time.
6. After doing the research and completing **page eight** of the article, each student group will draw their ecosystem on the 8" x 36" piece of paper. Ask the students to draw a picture of what the ecosystem looks like based on the description in the article and any other supplemental materials you have provided. This should include the environment as a whole, including plants and animals, and any other distinguishing characteristics of the ecosystem. Encourage them to use their imagination and reference their materials.
7. Each group will present this piece of paper during the live distance learning program. Markers or other very bold colors will improve the ecosystem visibility for the ranger(s). The students will present answers to the following questions to their classmates and the ranger(s) during the program. Prepare students for an oral presentation and assign them duties for sharing the following information:
    1. What elevation range is your ecosystem located within?
    2. How much precipitation does your ecosystem receive?
    3. What are the most common plant species? Name at least two.
    4. Name at least two animals found in their ecosystem.
8. Encourage your students to create a list of questions prior to the distance learning program. They will have the opportunity to ask these questions to the park rangers during the last ten minutes of the program. Please guide your students in writing thoughtful questions.
9. If you're interested in going deeper with our program please refer to page 10 which includes a list additional resources for the students to learn more about anything found in the article.

DURING THE DISTANCE LEARNING PROGRAM
Distance Learning Program Lesson:

Grand Canyon Focus: Ecology
School Subject: Life science
Grade Levels: 4^{th} – 8^{th}
Time Requirement: 1 hour program

National Standards Addressed in the live distance learning program:
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Lesson Overview
Grand Canyon is a classroom and laboratory where the study of ecology teaches us about our interconnections between each other and with the rest of the natural world.

Lesson Objectives: Students will be able to:
1. Demonstrate research skills
2. Discuss the difference between biotic and abiotic parts of an ecosystem and provide examples of each
3. Compare home ecosystem to one of the five ecosystems found at Grand Canyon

Materials needed during the live distance learning program with the rangers:
- Ecosystem posters created by student groups on the 8" x 36" piece of paper (total of 5)
- Page eight of Grand Canyon Ecosystems student article with ecosystem comparison chart
- One triangular shaped piece of paper (measuring three feet long, 16" wide at top, tapering down to a point.)
- Easel, whiteboard, or open wall space visible to the rangers during the distance learning presentation to post the ecosystem posters
- Tape or other items needed to attach posters to surface

Procedure
1. The ranger(s) will begin by reviewing the basic information about the size of Grand Canyon and the components found in every ecosystem. This will reinforce information learned from the Grand Canyon Ecosystems article.
2. After introducing the various ecosystems found at Grand Canyon, the ranger(s) will invite each group to present the information about their ecosystem that they prepared during the pre-program lesson.
3. After each group shares their information, tape the ecosystem drawing to the easel, wall or blackboard, where it is visible for the entire class to see. Ranger(s) will supplement information students know about their ecosystem and highlight special interrelationships found there.
4. Since it is unique to be able to find so many different ecosystems in such close proximity, the ranger will invite the teacher to post the triangular shaped piece of paper to illustrate how the Colorado River has carved a canyon, exposing land at many elevations with many different conditions.
5. Ecosystems are very complex systems with many different parts. Ranger(s) will discuss the concept of biodiversity. Encourage students to think about ecosystems near them, and to learn more about their own backyard.
6. The ranger(s) will conclude by spending ten minutes answering some questions the students prepared.

Extension Activities:
There are a variety of activities in the Natural History Lesson Plans on our website at:
http://www.nps.gov/grca/forteachers/classrooms/natural-history-lesson-plans.htm

Especially consider:
1) As an additional pre-lesson activity consider the Ecosystem Match-up, which will introduce the five Grand Canyon ecosystems we refer to during the distance learning program.
2) As an additional pre- or post-lesson, the Web of Life activity reinforces the interrelationships of different players in an ecosystem.